

Tjernlund Combustion Air Wiring Check List

Mark OK or N/A	Combustion Air Fan Performed Task Description	Step
	<p>Verify: Combustion air transducer sensing tube locations. Sealed Combustion: Note: Sealed combustion air requires the TD-2 Transducer.</p> <ul style="list-style-type: none"> • If possible, the sensing tube should be 2 times the diameter of the pipe past the farthest manifold connection, or • If not must be installed with sensing tube flush with the interior of combustion air intake delivery manifold pipe. In either case the Transducer must be after the discharge of the VSSI, VSRI, or VSUB series blower. 	<p>1</p> <p><i>Details Page 3 (Fig. A)</i></p>
	<p>Verify: TD-3 Transducer Port Connections. Open Combustion:</p> <ul style="list-style-type: none"> • To the "REAR" transducer pressure port on TD-3 and routed to an exterior or adjacent room location. • And the "Front" port should be open to mechanical room atmosphere 	<p>2</p> <p><i>Details Page 3</i></p>
	<p>Verify: Transducer Port connections. Sealed Combustion:</p> <ul style="list-style-type: none"> • To the "REAR" transducer pressure port on TD-2 and open to the atmosphere of the mechanical room. • And the "Front" port should be connected as in Step 4 to the combustion air delivery manifold. 	<p>3</p> <p><i>Details Page 3</i></p>
	<p>Verify: Field wiring of Combustion Air Pressure Transducers</p> <ul style="list-style-type: none"> • (TD-3 & TD-2) Match R to R, B to B & G to G on CPC-3 RED" combustion air terminal block and corresponding TD-3 or TD-2 Transducer terminal block. 	<p>4</p> <p><i>Details Page 4 (Fig. B)</i></p>
	<p>Verify that the TD-2 or TD-3 Transducer Wiring Cables are not in shared electrical device conduits.</p>	<p>5</p>
	<p>Verify: VSUB Combustion Fan Artic Duty Motor Heater (If mounted outdoors)</p> <ul style="list-style-type: none"> • VFD Terminals (F1 & F2) to Motor Terminals (H1 & H2) • Note: All VSUB motor heaters are 220 VAC. 115 & 460 VAC VFD's include a step-up or step down transformer so the output from terminals F1 & F2 is always 230 VAC. 	<p>6</p> <p><i>Details Page 5 (Fig. D)</i></p>
	<p>Verify: VSUB Combustion Fan Motor Limits</p> <ul style="list-style-type: none"> • VFD terminals (S1 & S2) Motor Terminals (Blue and Orange) 	<p>7</p> <p><i>Details Page 6 (Fig. E)</i></p>
	<p>Verify Combustion air Manual Pressure "Switches" wiring</p> <ul style="list-style-type: none"> • Field wiring of combustion air (PSA-1) is connected to the appropriate CPC-3 Combustion Air terminal blocks (P1 & P2) 	<p>8</p> <p><i>Details Page 4 (Fig. B)</i></p>
	<p>Verify: OPEN" & "SEALED" COMBUSTION AIR Manual Pressure Switch (PSA-1) sensing location:</p> <ul style="list-style-type: none"> • Install sampling tube in blower discharge, bending tubing 90° so that the open end points directly toward the blower discharge 	<p>9</p> <p><i>Details Page 6 (Fig. F)</i></p>

	<p>Verify:CPC-3 Combustion Air VFD(Variable Frequency Drive Wiring)</p> <ul style="list-style-type: none"> CPC-3 Combustion air control portion terminal strip is controlling the Universal Blower fan model indicator <p style="text-align: right;">[example =VFD-1H1 U 124C3]</p>	10
	<p>Verify: CPC-3 Combustion air fan VFD(Variable Frequency Drive Wiring)</p> <ul style="list-style-type: none"> VFD wiring pigtail color coding matches the corresponding CPC-3 Inducer terminal block connections (terminal to terminal) 	11 <i>Details Page 5 (Fig. C)</i>
	<p>Verify: VFD(Variable Frequency Drive) Input Voltage</p> <p>WARNINGS:</p> <ul style="list-style-type: none"> Verify that the input power voltage matches the VFD's nameplate rating before applying power. Incorrect supply voltages can damage VFD. 	12
	<p>Verify: that the Blower is rated for the same voltage as the VFD. Incorrect voltage can damage motor and VFD.</p> <ul style="list-style-type: none"> Fans are shipped wired for 460 volts. 230 VAC applications require that the voltage be changed inside of the motors junction box. Reference the diagram within the VSUB, VSRI, or VSSI installation instructions. 	13 <i>Details Page 5 (Fig. D)</i>

SENSING TUBE LOCATIONS FOR “SEALED” COMBUSTION AIR APPLICATIONS

The TD-2 Transducer sensing tube should be installed in the capped end of a common supply manifold. This is necessary so that only static pressure is measured.

- If the transducer sensing tube is installed in the side of a duct it **will also measure** velocity pressure, giving an **incorrect signal** back to the CPC-3 Controller.
- If mounting on the side of the duct pipe is unavoidable, the sensing tube should be **flush to the interior** wall of the duct.
- If a filter is installed it must be positioned between the blower inlet and intake opening, (See **Diagram C**).

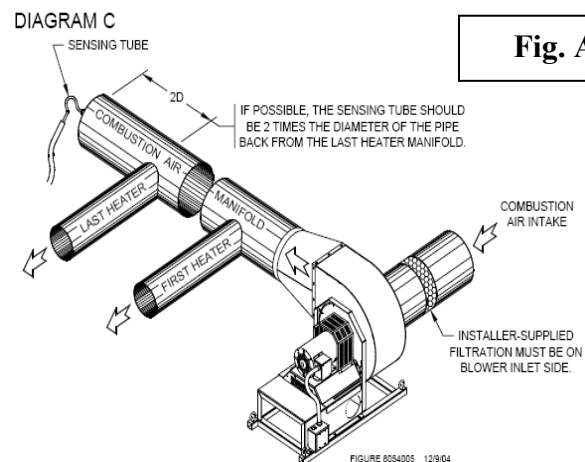


Fig. A

SENSING TUBE LOCATIONS FOR “OPEN” COMBUSTION AIR APPLICATIONS

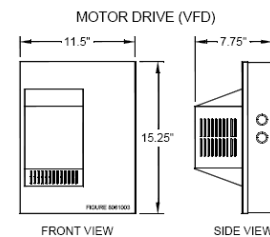
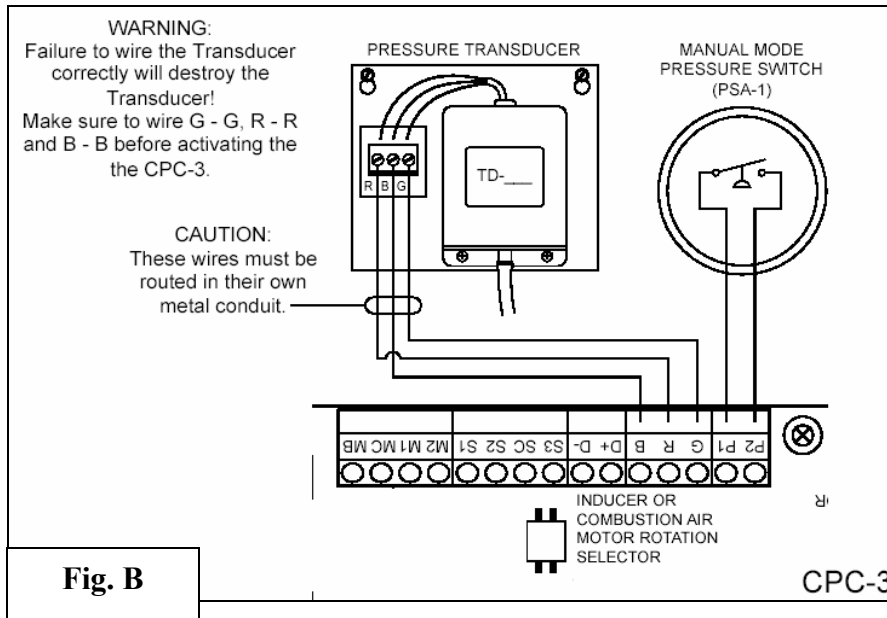
- In "Open" mode the mechanical room air is sampled and an adjacent space is referenced.
- Referencing an adjacent space within the building typically provides a more stable reference pressure than referencing outdoor air.
- In both cases, the goal is to reference static pressure. Don't sample pressures at locations that can be affected by frequently opened doors, elevator shafts, ventilation fans and diffusers.
- The **TD-3 Transducer**, sampling tube and fittings may be used to sample indoor reference pressure.
- The **TD-3 Transducer “REAR”** Sampling port is connected to a sampling tube located in a remote room or location.
- The **TD-3 Transducer “FRONT”** Sampling port is left open to sense the mechanical room's pressure atmospheres.
- If the TD-3 Transducer is located in a corner or non central mechanical room location, the front port can connected to a sampling tube routed to a more central location within the mechanical room for better overall room atmosphere sensing.

Pre-Start up field wiring verification

The CPC-3 has two sets of terminal strips across the top of its circuit board. All mechanical draft related connections are made on the "INDUCER" terminal strip located on the top left side of the circuit board. All mechanical combustion air related connections are made on the "COMBUSTION AIR" terminal strip located on the top right side of the circuit board.

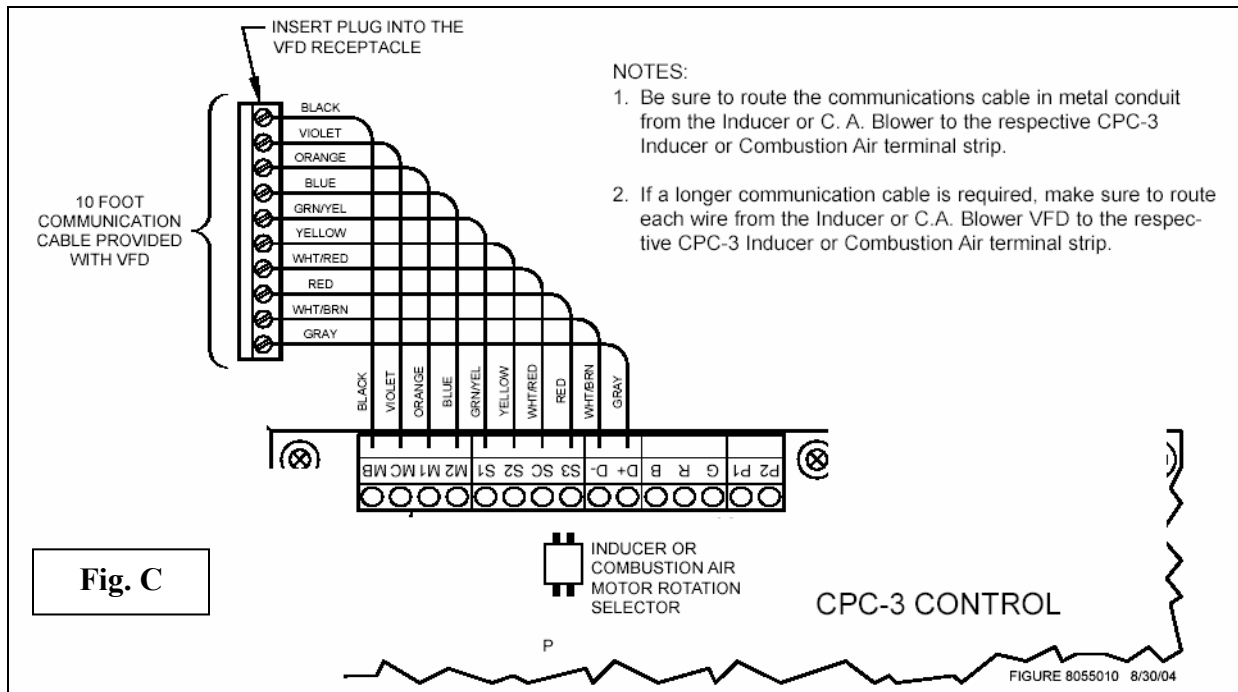
IMPORTANT: It is critical that wiring connections below are correct.

Verify **TD-2 or TD-3** Transducer connections (**Red** terminal blocks of Inducer or Combustion Air terminal strip) **G, R & B** are wired to the corresponding letter on the TD-Series transducer terminal strip. ***Failure to maintain proper polarity may damage transducer.**



IMPORTANT: These wire leads **must** be enclosed within dedicated metal conduit. Do not run any other power leads in the same conduit or share a junction box with any other leads.

- The inducer or combustion air manual mode proving switch, model PSA-1 should be connected to terminals **P1 and P2** of the Inducer or Combustion Air terminal strip. These leads may share conduit with other circuits within the mechanical room.
- The free end of the CPC-3/VFD communications cable should be wired to the **blue, black and green** terminal blocks of the CPC-3 inducer or combustion air terminal strip. It is critical that the colored leads be connected to the exact terminals as depicted on the wiring schematic. If the cable has been extended in the field wire labels should have been affixed indicating the terminal block designations.



IMPORTANT:

Confirm that the proper **VFD (Variable Frequency Drive)** is connected to the proper CPC-3 Control system.

- **Verify** that the CPC-3 Combustion air control portion terminal strip is controlling the Universal Blower fan VFD model indicator

[Example =VFD-1H1 U 124C3] Combustion

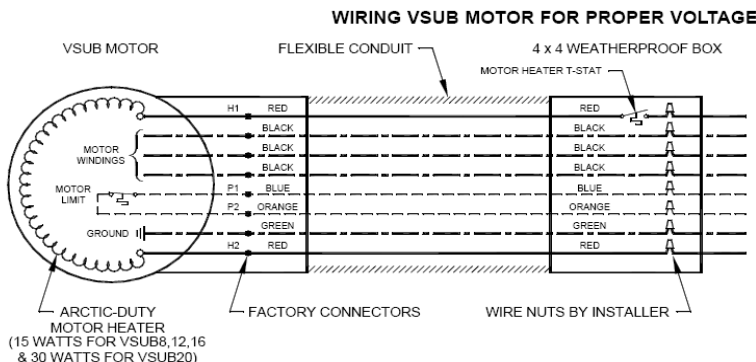
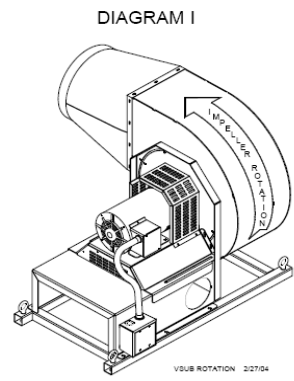
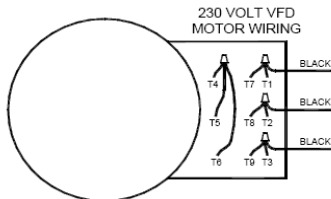
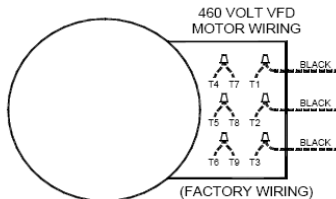
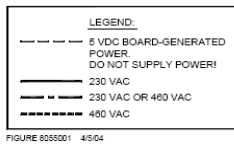


FIG. D

IMPORTANT:
THIS UNIT IS FACTORY-WIRED FOR 460 VAC VFD APPLICATIONS. IF YOU ARE USING THIS UNIT WITH A 230 VAC VFD, REWIRE THE MOTOR LEADS AT THE MOTOR ELECTRICAL BOX AS SHOWN BELOW. ALL MOTOR WIRES ARE LABELED T1 THROUGH T9. THE MOTOR LIMIT WIRES ARE P1 AND P2. THE MOTOR HEATER WIRES ARE H1 AND H2. USE THE MOTOR HEATER WHEN THE VSUB IS INSTALLED OUTDOORS WHERE THE AVERAGE WINTER TEMPERATURES ARE BELOW FREEZING.



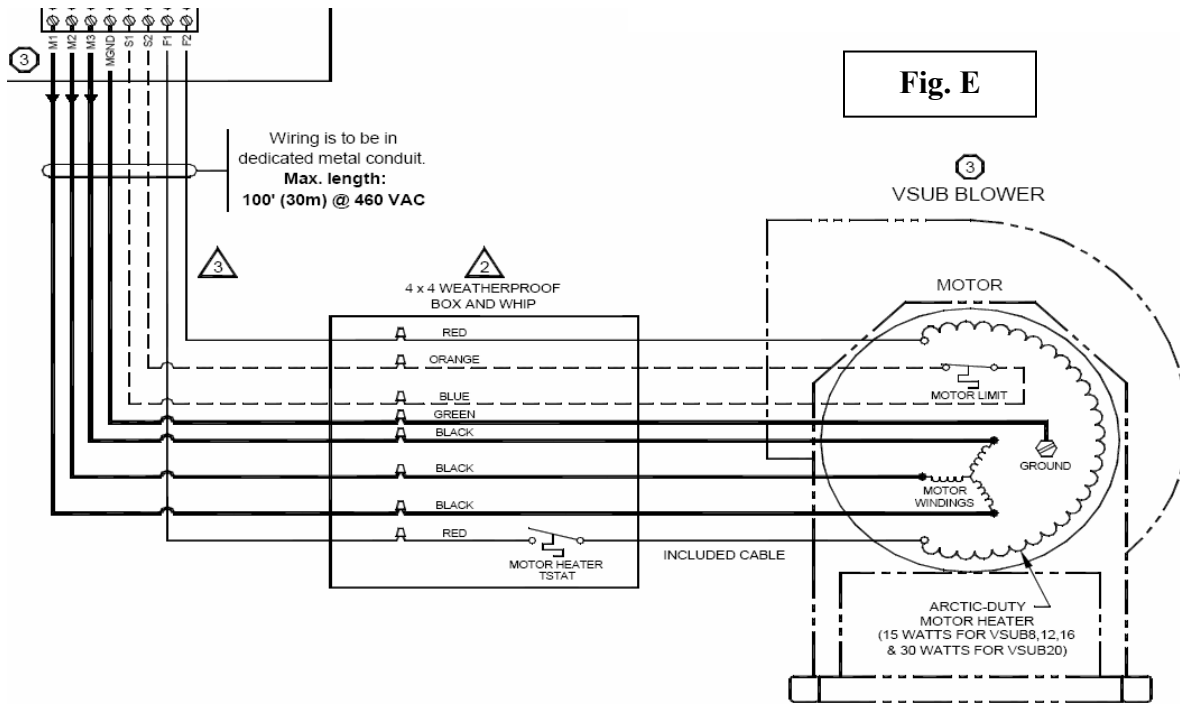


Fig. E

VSUB SERIES BLOWERS FOR "OPEN" & "SEALED" COMBUSTION AIR:

Install sampling tube in blower discharge, bending tubing 90° so that the open end points directly toward the blower discharge, See Diagram D.

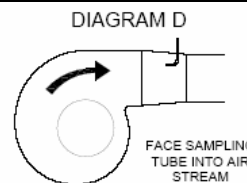


Fig. F

CPC-3 BOARD CALLOUTS

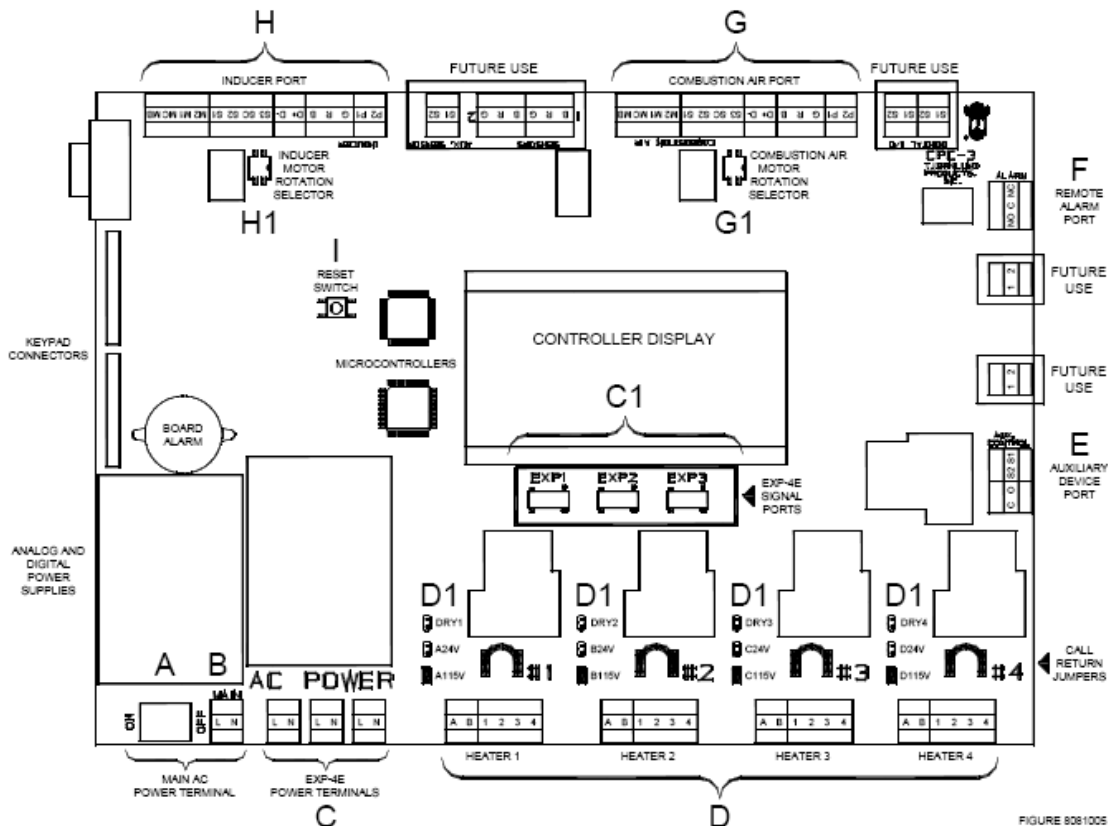


FIGURE 8081005

- A) **CPC-3 Main Power Switch**
- B) **Power Supply Input Terminals:** Accepts either 115 or 230 VAC, 50/60 Hz. 230V power can be supplied from VFD L & L Terminals.

- C) Power Supply Output Terminals:** Supply power to accessory EXP-4E Expansion boards.
- C1) EXP-4E Expansion Modules:** Communications connections from EXP-4E Expansion boards.
- D) Heater Interlock Terminal Blocks (Four):**
Positions A & B are for dry contact actuation, with A outputting 5 VDC and B needing 5 VDC to activate the CPC-3. Positions 1 & 2 require either 24 or 115 VAC from a heater control circuit to activate the CPC-3. A factory installed call return jumper wire above each terminal block routes the voltage connected from position 1 to position 3. When the CPC-3 safety circuit is made it switches position 3 to position 4, where the intercepted heater control circuit is routed back to the heater. Positions 3 & 4 are used independent of positions 1 & 2. If the A & B dry contacts are used to activate the CPC-3 (Call return jumper wire must be removed).
- D1) IMPORTANT:** Each six position terminal block includes a RED jumper tab to select the heater interlock voltage that is connected heater terminal block. Place RED jumper tab in Dry for positions A & B, 24V or 115V for positions 1 & 2 depending upon heater interlock voltage)
- E) Auxiliary Device Terminals:** Used to activate a motorized damper/louver in series with the inducer/blower activation by switching power to device through terminal C & O. Position S1 outputs 5 VDC to be switched through a damper end switch and returned to position S2. This incorporates the end switch closure into the overall CPC-3 safety circuit. Positions S1 & S2 may also be used to react to the contact closure of a carbon monoxide alarm. The functions of C & O and S1 & S2 are independently activated through the Auxiliary Device key.
- F) Remote Alarm Terminals:** Used to activate a remote alarm through either normally open or normally closed contacts. A power source is routed to the C position and returned out of either the N/C or N/O positions if an alarm condition exists.
- G & H) Draft and Combustion Air Terminals:** The CPC-3 can independently control mechanical draft and combustion air inducers/blowers. While the software that runs these functions differs, the communications to the VFD's that control the inducer/blower is identical. The following information is applicable to both the Inducer and Combustion Air terminal strips.

Positions P1 & P2 are for the PSA-1, manual mode proving switch. Position P1 outputs a 5 VDC signal to the PSA-1 Proving Switch. When the switch closes it returns the signal to position P2, allowing interlocked heaters to operate with the CPC-3 in Manual Mode.

Positions G, R & B connect to a TD-Series transducer. Position G receives the 1-10 VDC output from the transducer.

Position R is the 24 VDC power supply to the transducer. Position B is the ground for the transducer. Positions D+ & D- connect to the VFD through the included communications cable. Position D+ outputs a 1-10 VDC signal to the VFD to modulate the inducer/blower. Position D- is the reference ground.

Positions S3, SC, S2 and S1 connect to the VFD through the included communications cable. These connections enable reset of a faulted VFD and reverse the rotation of an inducer/blower from the CPC-3 controller.

Positions M1, M2, MC and MB connect to the VFD through the included communications cable. Position M1 outputs a 5 VDC signal to the inducer/blower limit circuits. This signal must return to position M2 or a mechanical fault will be posted on the display and the Limit Status OK LED will not be lit. Position MC outputs a 5 VDC signal to a N/C fault relay within the VFD. This signal must return to position MB or a VFD fault will be noted in the display and the VFD Status OK Green LED will not be lit.

- G1 & H1) Inducer / C.A. Blower Rotation Selectors:**
Below the Inducer (Draft) and Combustion Air terminal strips are two sets of dip switches. These dip switches determine the rotation of the inducer/blower being controlled by that particular terminal strip. The two dip switches at each position must always be switched opposite of each other or the VFD will receive simultaneous FWD/REV run commands, causing it to fault. See "Checking Rotation", page 12.
- I) CPC-3 Reset Button:**
Pressing this button resets the CPC-3 controller with a "soft boot". It can be used in lieu of the power switch to "re-boot" the microcontrollers of the CPC-3 without power spiking the board.

Tjernlund Combustion Air Wiring Check List

Wiring

- Low Voltage VFD Control Cable Wiring to CPC-3
- Low Voltage TD-Series Transducer & PSA-1 Manual Mode Fan Prover Wiring to CPC-3
- Remote Alarm / Auxiliary Device Wiring
- VFD to Inducer / C.A. Blower Wiring
- CPC-3 Main Power Input & Heater Interlock Wiring
- Pre-start up Field Wiring Verification

Start Up of CPC-3

- Powering & Initializing CPC-3
- Default CPC-3 Program Settings Unlocking & Locking the CPC-3 Keypad
- Setting CPC-3 Time and Date
- Activating the Draft or Combustion Air

Testing the Operation of System components

- Test Run Set Up
- VFD and Pressure Transducer Response
- Checking for Proper Rotation

Combustion Air Adjustment

- "Open" & "Sealed" Combustion Air Modes of Operation
- Combustion Air Set Point Adjustment
- "Open" Mode System Start Up
- "Sealed" Mode System Start Up

Auxiliary Devices

- Alarm Buzzer
- Aux Sensor Set up Aux Device Set Up

CPC-3 Options

- Resetting VFD Drive(s) Setting Pressure Units of Measure
- Viewing & Resetting Fault History
- Set Stages & Burner Interlock Verification
- Setting Pre and Post Purge

Manual Mode Operation and PSA-1 Fan Prover Switch Adjustment

- Switch Adjustment